INTERACTIVE, MULTISENSORIAL TEACHING AIDS FOR DESIGN

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ABSTRACT
This work demonstrates the use of the experimental application, Communication and Information Technologies (CIT), by the university Design department. It discusses the development of educational material, specifically interactive multimedia, composed of multimodal and multi-sensory elements and resources (images, sounds, verbal messages, etc.) which offer support to the learning process of specific course material in the Design Degree programme at the Cuajimalpa Campus of the Universidad Autonoma Metropolitana. The usefulness and principal importance of the incorporation of multimodality and multi-sensoriality into the concept of educational material is that each method of communication (speaking, writing, gestures, visual language through colours, graphs, diagrams, photographs, video, diverse page formats, auditory and tactile language) contributes in a specialized or cooperative manner to give meaning to a wide range of methods of representation and communication of messages. Each one of the modes can be considered a channel of communication which provides information that is sometimes equivalent and other times complementary. It is the interaction between these different modes which makes the construction of the meaning possible, contributing to a clear and effective understanding and interpretation of the contents by the student. Diversifying and modifying the methods of presentation of the material increases the interest, understanding and assimilation of the information by the students, especially in topics of a theoretical nature.

Keywords: Multisensorial Human Channels, Phases of Learning Process

1 INTRODUCTION

The Design programme offered at the Universidad Autonoma Metropolitana's Cuajimalpa campus is characterized by its aim to shape a student with a broad professional profile within the design sphere. It strives to create designers capable of identifying the necessities and problems of communication and human interaction which require design solutions in three realms: visual spaces, products and messages. Its intent is to produce graduates who are able to propose, organize and make two and three dimensional design solutions that materialise new spaces, objects and images representing the values of contemporary society which is in constant evolution. The Design Programme's course plan is composed of 12 terms (4 years) with 56 courses divided into three formative groups: the initial, the basic and the professional. Each one of the courses is oriented by the nature of its material to be a theoretical course or a practical course. The course which has material containing the didactic support discussed in this paper is called "Plastic Languages in Art and Culture". It covers material classified as theory and belongs to the basic formative group. The objective of the basic level is to provide a student with basic knowledge and tools which allow his understanding of design in integral environments, as well as allow him to be able to

confront challenges in projects of low complexity, to integrate design proposals with visual language, a design lexicon and synthetic characters, going from the idea to the concept and the concept to the project.
The course in particular, has an objective to analyse and understand the languages used in artistic cultural expression of the 20th century, as well as to become familiar with the aesthetic sensory elements that integrate productions of that era. The student is encouraged to identify and to analyze the socio-cultural values involved in cultural-artistic languages in their historical contexts, as well understand the importance and influence that socio-cultural movements had on the development of design elements.
With these objectives as a base, it is necessary for the lecturer to present the material relying on examples of a very diverse nature such as objects, graphical messages with different diverse supports, images of spaces, literature, music, film, etc, which all belong to different cultural artistic expressions of the 20th Century. The presentation of these examples has been an important aspect, among others, that impelled the conception and development of this educational material, which represents a didactical support that allows the lecturer to organize and present these diverse examples.
Another aspect of enormous importance has been the theoretical nature of the course. At UAM Cuajimalpa, it is possible to state that this type of course is indeed one which generates less interest, less motivation and even apathy amongst the students. This is due to two aspects. The first aspect is that a direct application for the knowledge presented and acquired in the classroom does not often exist. The second aspect is the lack of practice and taste for reading amongst the pupils, as well as a dislike and lack of interest in searching for bibliographic information. The necessity for the development of a learning aid for specific topics was created to encourage active participation of the student and an interest in theoretical topics, as well as to increase and reaffirm student knowledge through the application and hands-on activities which generate interest.

2 PEDAGOGICAL MATERIAL CONCEPTION

In addition to the considerations discussed above, there exist a series of theories which form a basis for the conception and development of the interactive material for the course “Plastic Languages in Art and Culture”. Their specific characteristics will be discussed below.

2.1 The education process learning and its stages

To be able to create educational material which was pertinent and suitable for the contents and objectives of a course, the learning process of individuals and the stages of the process were studied, with the purpose of determining and locating the reaches and application of the material within the process.
According to Ogalde and Bardavid (2003) learning is seen as a process divided into seven phases, each one of which corresponds to different events that allow stimulation of the stages they are directed to. This is observed in Table 1 where the diverse phases within the process and the events that stimulate each phase become evident. When comparing the phases shown in Table 1 to the curriculum objectives of the initial formative level of the Design Degree, as well as the material covered in “Plastic Languages”, the educational application will serve as a educational aid for the first three phases of the learning process. The motivation phase, where the student has expectations, is where the motivation is activated. The phase of understanding or selective attention is where it is possible to capture the attention of the student, and the last phase of acquisition is where it is possible to stimulate memory and to guide information acquisition and learning.

Table 1: Learning phases and the suggested events based on Ogalde and Bardavid [1]

Learning Stage	Suggested event
Motivation & Expectation Stage	Motivation activation / Activity objective information
Comprehension & Selective Perception	Attention orientation
Acquisition Phase. Encoding. Accumulation access	Remembering stimulation / Orientation during learning
Retention Phase. Recuperation	Retention intensification
Generalization of Transference Phase	Stimulate regarding theme transference
Response in Action Phase	Produce action / Supply feedback

2.2 Perceptual nature of the individual - the multisensoriality

Continuing with the search to create educative material pertinent and suitable for the contents and necessities of the course "Plastic Languages", as well as considering the necessity to activate a student's motivation and interest, capture his attention, acquire information and finally to facilitate learning, the educative material was based on an important human characteristic: multi-sensoriality. This leads us to consider different sensory perception modalities through translating multi-modally the theoretical material being transmitted.

According to Ibarra (1999), it is possible to affirm information perception, and, therefore, learning and the development of intelligence occur jointly in a body/mind relationship. We experience the surrounding world through our sensory-motor systems, and through these experiences we can affirm our thoughts, creativity and learning. Therefore it is fundamental to generate an environment where the sensory experience is rich and free, a place where the possibility to create complex learning patterns exists and where thought is activated and creativity flourishes.

Although human perception is constantly poly-sensorial, generally only one sense is spoken to at a time. Nevertheless it is necessary to consider the totality of the sensorial sphere. Man's normal situation is poly-sensorial (we favour the signals of only one sense at a time), as Gimeno (1986) mentions, external stimulation is exerted inevitably on more than one sense although the information is sent to only one sense, we nevertheless activate profound synergic mechanisms. Thus sensory synergies and kinaesthesia rule our everyday existence and operate automatically and unconsciously, and the elements that make up our surroundings reflect this human characteristic.

For example, acoustic waves do not only act on the auditory organ (outer ears, internal ears), but the vibrations are also perceived in the epidermis of the subject and completed by visual investigation for the source of the sound. In that sensory conjunction and the 39^{th} area of the cortex (integration area) all the messages of the stimulating sonorous source come together and the next order of action is produced. In the same way, the sense of smell and taste operate jointly to identify and to classify a certain flavour, and hearing and sight act in a complementary form to calculate and determine distances. According to Gimeno (1986) there are three modalities in which this sensory cooperation takes place:

1. A main sense receives stimulus and it "asks" for cooperation from the rest (leading effect)
2. A single stimulus causes the intervention of several senses simultaneously (simultaneous effect)
3. Several senses act at first, and by selection, the action of one or more of them is inhibited (inhibiting effect)

These are the situations produced when an individual interacts with his environment. In addition to its principal benefit of being a educative material, it also allows the student to experience a rich and free sensory experience, where the possibility of creating

complex patterns of learning, and activating thought and creativity exists. The importance of multi-sensoriality also rests in what J.R. Gimeno (1986) pointed out , that in recent years a new set of principles and performances that traditionally constituted sensory education have been reborn and strengthened, thanks to the contribution of several disciplines such as Evolutionary Psychology, Physiologic Psychology and cognitive theories.
According to Gimeno (1986) there are three recent approaches in sensory education:
1. There is no creation of precise mental organization without adequate sensory activity.
2. Cerebral activity mechanisms benefit from contact with a rich environment and the possibility of early sensory answers.

The learning process in general, as well as intelligence, benefits from a suitable attitude towards rich and effective stimuli. Different methods of presenting the material generate diversity, and variety in the perception of knowledge foments greater interest.

3 CONCEPTION AND DEVELOPMENT OF THE INTERACTIVE MATERIAL

Based on the previous statements, the main objective of the educational material developed was to design a prototype level interactive multimedia product aimed at guiding the attention of the student towards learning the specific material covered in "Plastic Languages", a course which is part of the curriculum of the Design Degree offered at UAM-Cuajimalpa.
The following specific objectives were defined: a) Create an educative material with characteristics that allow the active participation of the student, b) Draw the attention of the students towards the "Plastic Languages" course offered in the Design Degree programme at UAM- Cuajimalpa, c) Lead the student to acquire and reaffirm new knowledge through application and by hands on activities which generate interest in the student.
The assumption made was that the application of a multimedia interactive product would capture the attention of students during the learning process of the material offered by the course "Plastic Languages in Art and Culture" which is part of the curriculum of the Design Degree at UAM-Cuajimalpa. The plan for the design of the interactive material was to develop the main screens up to the prototype level, so that the application could be evaluated by the students in order to determine the pertinence of the media's concept and format. Based on statements made by Lacelle (2006) about a prototype being a limited representation of the material being developed which allows for exploration of its use and evaluation under real conditions, the development of the prototype will be followed by an evaluation by students in the Design Degree programme at UAM-Cuajimalpa. Unfortunately the users' evaluations are still being conducted as this paper is being written and therefore cannot be presented. It is proposed that the results of the evaluation will be presented in a later work.

3.1 Methodology Used

The methodology used for the development of the design for the educative material was based on the methodology proposed by Ramirez (2006). He proposed a triple methodological tree that considers the creation of a conceptual, theoretical, historical and referential frame, as well as a definition of the problem being studied, the creation of the design proposals, their evaluation and finally the production. This tree has been modified in the production stage to adjust it to specific characteristics of the proposed product which considers the development of educative multimedia material that looks for the development of the contents of a course and hyperlinks.
The criteria on which the selection of the proposals for the design of the interactive material was based was, firstly, on the facilitation of the visualization of the

information, based on the characteristic appearance and properties of the visual attributes that make up the proposal such as colours and the arrangement or nature of the formats that agree with the laws of human visual perception such as the Gestalt. Once this was done, the next phase was initiated. In this phase the proposal was completely structured, and other sensory attributes which complemented and integrated the visual information were incorporated. Once this phase concluded, the development of the prototype began.

In this phase the methodological tree (Ramirez, 2006) was complemented by the methodological proposal made by Buitron (2006) in which were added: the definition and planning of previous characterized material, the portioning of the information, the creation of the navigational map which determined the interactivity of the proposed media, and finally the construction of the interactive product. The tree considered the continuation of the process until the definitive implementation of the product, going through the development of the definitive prototype, implementation of the prototype, collection of results, corrections and modifications, definitive implementation and maintenance and improvement of the proposed product. However, as mentioned previously, the present article can only describe the conception and development of the interactive product since the evaluation by users is being carried out at the time of writing.

4 DESCRIPTION OF THE PROPOSAL

The proposal of the interactive multimedia consists of a general presentation of the topics included in the programme. The subject of the 9th session was chosen. It discussed the main exhibitions of Surrealism like a language that arose from human irrationality and the liberation of the unconscious.

Architecture of Information. The sections were delimited to those that conform to being structured by paintings, cinema, music, object found or "Ready Made" and architecture.

Division and Structure of the information. For the development of the contents, the proposal of Tom Boyle (2002) was considered. He believed that the construction of the educational multimedia involved the contemplation of three macro-functions.

1. Macro-Function of the Content's Structure. This involves the selection and construction of the educational contents the media will have to contend with.
2. Interactive Macro-Function. The designing of the contents and their complexity considering the users.
3. Composition Macro-Function. The creation of a coherent multimedia composition which considers the depth and extent of the information.

The information displayed in the proposed multimedia is made up of several nodes hyperlinked to each other. In the first node there is a short animation that presents the multimedia. The second node is the initial screen of the multimedia which contains the topics by principal authors in each plastic language. At the top of the screen there is a navigation bar containing the main buttons which make up the multimedia. Each of these buttons is linked to screens that contain the information referring to the plastic language types.

Once the exploration of the multimedia is concluded, a reinforcing activity, by means of a sensory game in which a marathon board screen appears accompanied by cards of questions and a dice, is carried out. Each card will have questions grouped into six categories, corresponding to the subjects dealt with by the multimedia. For example, in painting, the student is asked to modify a photo so that it corresponds to the surrealistic plastic language; in music, the student has to whistle the equivalent sound, etc. The value of each question is indicated in a box on each card. Four teams are organized and a grey piece stands for ignorance. A positive reinforcement system is proposed by awarding prizes in kind or grades for the winning team.

Following are some examples of screens designed for the multimedia.

Figure 1: Initial screen of multimedia

Figure 2: A multi-sensorial game.

5 CONCLUDING REMARKS

The lack of interest, poor motivation and even apathy of the students in the initial phase of the Design Degree at UAM Cuajimalpa, towards topics of a theoretical nature, such as history of arts and design are interfering with the learning process of the students.

The creation of a material that supports the development of daily lessons and which is based on human multi-sensoriality and active participation by the student through exercises in which knowledge is applied, offers a solution to this situation.

Basing the creation of educative material on human multi-sensoriality leads us to consider different modalities of sensory perception of individuals, as well as find translations and present multi-modally the theoretical contents to be actively transmitted to the students. Through the new multimedia, we have strived to lead the students through a rich and free sensory experience where it is possible to form complex learning patterns, activate thought and give rise to creativity.

At the present time, the educative support material is being evaluated by the users (students) to determine its effectiveness or need for modifications. Ascertaining the performance will allow us to obtain patterns to create a series of supporting educative material for other courses which are also theoretical in nature.

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